(12) UK Patent Application (19) GB (11) 2 040 693 A

(21) Application No 8002601
(22) Date of filing 25 Jan 1980
(30) Priority data
(31) 7902962
(32) 27 Jan 1979
(33) United Kingdom (GB)
(43) Application published
3 Sep 1980
(51) INT CL³
A63B 53/00
(52) Domestic classification
A6D 21C
(56) Documents cited
GB 2023012 A
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GB 448561
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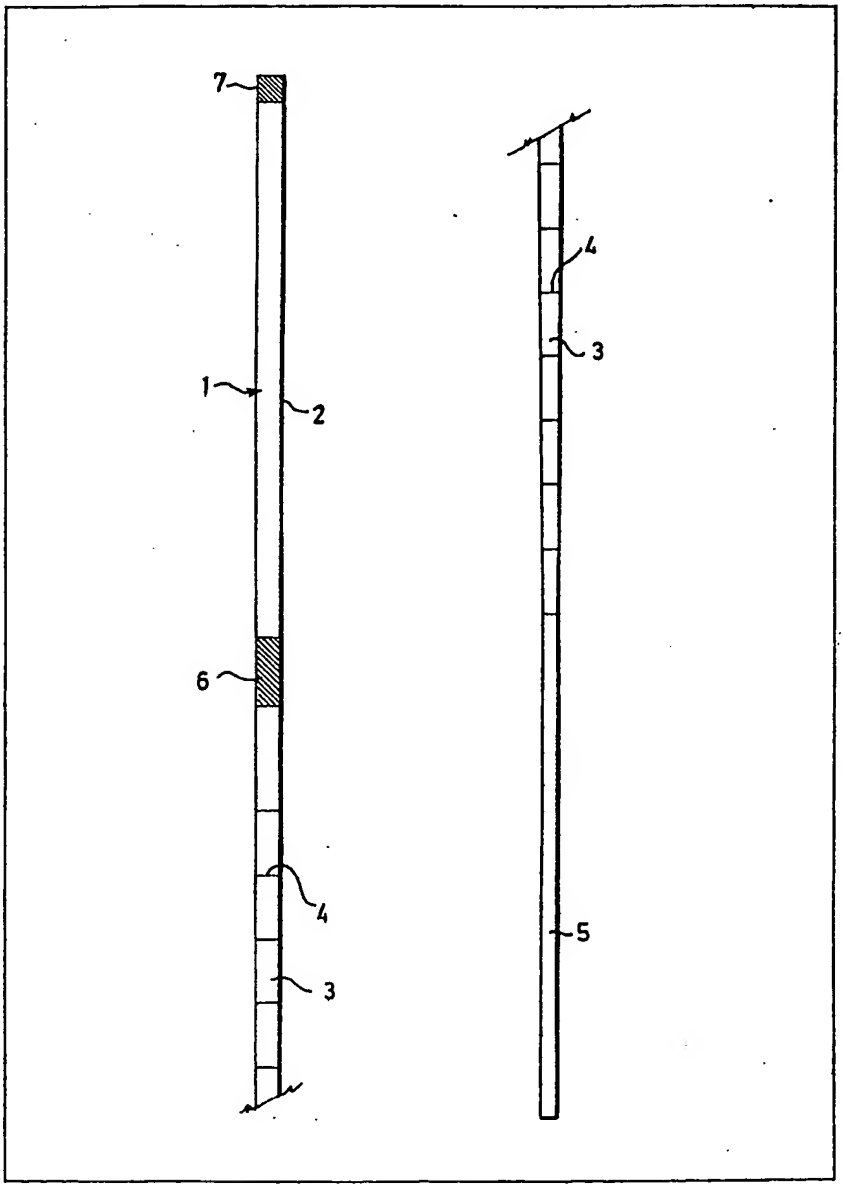
(58) Field of search
A6D
(71) Applicants
Ronald Reginald Frost
2 Esk Way,
Rise Park,
Romford,
Essex.
(72) Inventors
Ronald Reginald Frost
(74) Agents
Marks & Clerk

(54) **Weighted golf club shaft**

(57) A golf club shaft 1 having, at a non-terminal location thereof, a mass per unit length substantially greater than the average mass per unit length of the shaft, in particular having a small weight 6 added to the shaft 1 e.g. inside a tubular shaft.



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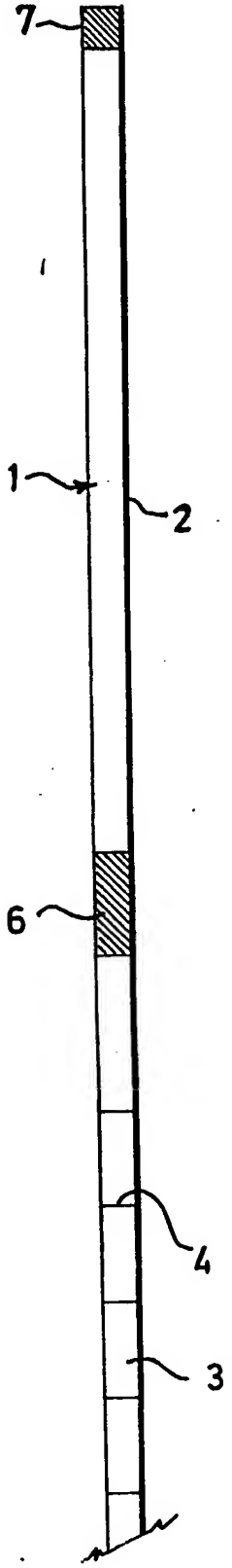

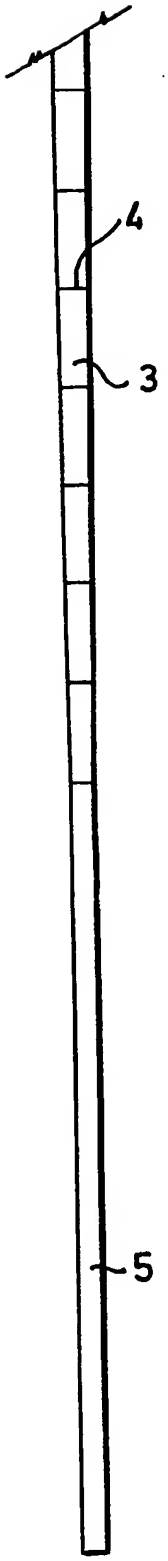

SPECIFICATION

Weighted golf club shaft

This invention relates to a golf club shaft which is weighted at a point intermediate the grip position and the tip, and to a golf club comprising such a shaft.

In golf club design, an important feature is to arrange for the maximum amount of energy to be delivered to the ball at the moment of contact. Various modifications of the club have been suggested including weighted club heads and flexible shafts. A shaft which flexes during the stroke is a popular solution to the problem. Flexing of the shaft gives a good "feel" to the club and enables the ball to be hit higher and further. At the moment of impact the shaft is bowed slightly forward so that a point intermediate the tip and the handle (the flex point is further forward than the tip of the shaft. This flexing action provides increased loft and also serves to "close" the face of the club to a certain extent. Because of these advantages various modern golf clubs are provided with flexible shafts. Thus, e.g. shafts are now of tubular section and over length may be parallel, stepped down or down or tapered so as to provide the required degree of bowing at any one point, while other shafts are formed of a stiff material, but have incorporated in them a springy flex point near the hand grip.

It is also desirable for the club to have as light a swing weight or pull weight as possible, and for this reason shafts are now produced of light weight material such as carbon fibre-reinforced plastics, tubular alloys etc.

I have now found that desirable degree of bowing can be achieved by adding a small concentrated weight to the centre of the shaft, i.e. between, and distanced from, the hand grip and the tip. This centre weighting has the effect of accentuating the bowing action, thus providing more rapid shaft recovery at the tip.

Thus, according to the present invention, I provide a golf club shaft having, at a non-terminal location thereof a mass per unit length substantially greater than the average mass per unit length of the shaft.

The increase in mass per unit length is conveniently achieved by the addition of a small weight to the shaft, either in the form of an external loading, e.g. binding with lead tape, or the application of an internal loading, e.g., a weighted plug inside a tubular shaft.

The weight applied will, for a standard full-size golf club be of the order of 3.5 to 12 g, preferably from 6 to 8 g and is desirably confined to one small location on the shaft. Thus, e.g., a length of from 1.0 to 4.0 cm is adequate for the weighted location.

The weighted location is at the so-called upper "flex point" of the shaft, i.e. a point on the shaft above that point which is furthest displaced from a straight line joining the two ends of the shaft when the shaft is in its bowed state at the point of impact. In practice, the weight location may be just below the gripping section of the shaft, but above the usual tapered portion which lies between the bottom of the gripping secti n and the tip.

Adding weight to the shaft between the hand grip and the tip may add t the swing or pull weight of the club. If the added weight is at or about the swing weight balance point, no increase will occur. But if the added weight is below the swing weight balance point then an increase in swing weight occurs. This increase in swing weight can be overcome by adding a small compensating weight to the extreme upper end of the shaft above the hand grip to restore the moment about the hand grip. Thus, e.g. if a shaft weight of Xg is added at a distance of Y cm below the hand grip, then a compensating weight of 2 Xg should be added Y cm above, thus restoring the moment.

In order to compensate for the increased weight of the shaft, the overall weight increase in the club can be reduced by using a lighter head, e.g. in the range 4 to 12 g lighter. This has the advantage of raising the centre of gravity of the club, which again aids the swing.

The shaft according to the present invention can be formed of any suitable material and is conveniently formed from one of the commonly used materials such as light weight steel or alloy or carbon-reinforced plastics. The weight added to the shaft so as to provide the location of higher mass may be permanently fixed, e.g. by incorporation in the shaft during its manufacture, or alternatively may be arranged to be adjustable by the user, e.g. a movable external collar or sleeve.

In some clubs it may be necessary to further modify the club by addition of a small counterbalance weight at the top of the shaft, below the hand grip.

According to a further feature of the present invention I provide a golf club comprising a shaft as defined above.

Using a weighted shaft according to the invention, it is possible to convert a club such that the driving range can be increased by several metres. Furthermore, the shaft according to the invention has the advantage of being simple and cheap to manufacture and does not require any elaborate technology, unlike the shafts with specially flexible zones.

The accompanying drawing illustrates one preferred embodiment of the invention, as applied to a driver shaft.

A tubular shaft 1 of overall length 109 cm comprises three portions: a gripping section 2, approximately 34 cm long and 1.5 cm in diameter; a tapered section 3, approximately 48 cm long and tapering from 1.5 cm diameter down to 0.8 cm in a series of steps 4; and a tip section 5, approximately 27 cm long and 0.8. cm in diameter.

A weighted plug 6 of 7 g mass fills the bore of the shaft at the lower end of the gripping section 2. The plug 6 is about 3 cm long. If necessary, a small counterweight 7 is incorporated at the very top end of the gripping section 2. Other dimensions will, of course, apply to shafts for clubs other than drivers.

CLAIMS

1. A golf club shaft having, at a non-terminal

locati n there f, a mass per unit length substantially greater than the average mass per unit length of the shaft.

2. A shaft according to claim 1, in which the said location is from 0.5 to 2.6 cm long.

3. A shaft according to claim 1 or claim 2, in which the said location is at the upper flex point of the shaft.

4. A shaft according to claim 1, in which the increase in mass per unit length is achieved by addition of a small weight to the shaft at the said location.

5. A shaft according to claim 4, in which the weight is an external or internal loading.

6. A shaft according to claim 5, in which the weight is located inside a tubular shaft.

7. A shaft according to claim 5, in which the weight is a lead-containing tape binding.

8. A shaft according to claim 4, in which the weight is from 3.5 to 12 g.

9. A shaft according to claim 8, in which the weight is from 6 to 8 g.

10. A shaft according to claim 4, having a balance weight applied to the upper end thereof to balance the moment caused by the first weight about the hand grip.

11. A golf club including a shaft as claimed in any of claims 1 to 10.

12. A golf club shaft substantially as herein described with particular reference to the accompanying drawing.

Printed for Her Majesty's Stationery Office by Croydon Printing Company Limited, Croydon Surrey, 1980.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.